densely villose when the flowers open, becoming nearly glabrous, 1.2–3 cm. in length; stipules oblanceolate, long-acuminate, coarsely glandular-serrate, 1–1.2 cm. long, deciduous in May. Flowers opening early in April, 2 cm. in diameter, in compact many-flowered villose corymbs, furnished with deciduous hairs; calyx-tube glabrous, the lobes narrow-acuminate, coarsely glandular-serrate, glabrous on the outer surface, sparingly villose on the inner surface; stamens 20; anthers "brownish gray"; styles 2 or 3, surrounded at the base by a conspicuous tuft of long white hairs. Fruit subglobose to short-oblong, scarlet, 1.5 cm. in length; nutlets 5, acute at the ends, broadest at the apex, obscurely grooved on the back, 6–8 cm. in length.

A slender tree 4–5 m. high with a trunk rarely more than 15 cm. in diameter, and spreading branches; common in open woods, growing on creek bottoms and dry uplands near Olney, Richland County, southeastern Illinois, *R. Ridgway*, May 14, 1921, April 29 and August 20, 1924 (Nos. 1375, 2087 & 2041, type); *E. J. Palmer*, May 14, 1923 (No. 22615).

Judging by the habit of this tree and the shape of the leaves it is an unusually small-fruited *Molles* species approaching in the size of the fruit plants of the *Coccineae* group which, although common in northern Illinois, is not found as far south anywhere as Richland County.

I am glad to associate with this interesting plant the name of Robert Ridgway, the distinguished ornithologist.

× **Crataegus Whitakeri,** n. hyb.? (*Molles* sp.? × *Macracanthae* sp.?).

Leaves broad-ovate, acute, rounded or abruptly or gradually narrowed at base, often slightly divided into short acute lateral lobes and coarsely and irregularly serrate with acute teeth, sparingly villose below, especially on the midrib and primary veins, becoming nearly glabrous in the autumn, dark green on the upper surface, rather paler on the lower surface, 8–10 cm. long and 6–7 cm. wide; petioles stout, densely villose early in the season, becoming glabrous or nearly glabrous, and 8–15 mm. in length. Flowers opening early in June, 2 cm. in diameter, on slender pedicels densely villose like the 6–12-flowered rather compact corymbs; calyx thickly covered with matted pale hairs, the lobes glandular-serrate, nearly glabrous above, densely villose below, deciduous or persistent on the fruit; stamens 20; anthers "pale green fading to blackish"; style surrounded at the base by a conspicuous tuft of white hairs. Fruit ripening early in October, on stout pedicels, in nearly glabrous few-fruited clusters, subglobose to ovoid, crowned by the persistent calyx-tube, orange red, up to 1.5 cm. in diameter; nutlets 2, ellipsoid, often slightly broader at the apex, rounded or slightly ridged on the back, furnished on the inner surface with irregular shallow depressions or ocassionally with a short deep pit, 1–1.2 cm. long, 1 cm. wide.

A tree from 5–6 m. tall, with a trunk 3.5 dm. in diameter, a wide head of spreading branches and stout branchlets without spines in the Arboretum specimens.

In an upland field of the Page Whitaker farm, Richland County, southeastern Illinois, *Robert Ridgway*, October 7, 1923 (No. 2057, type for fruit), June 2, 1924 (No. 2105, type for flowers). Small trees in an adjoining field are believed by Dr. Ridgway to be seedlings from this tree (Nos. 2057 and 2105) but of these I have seen no specimen.

In habit, spreading branches, stout large branchlets and large leaves it resembles a *Molles* species, while in the shape of the leaves, the size and color of the soft fruit, the two nutlets and the nature of their lower surface it resembles a *Macracanthae* species.

Crataegus coccinioides Ashe, a species of the *Dilatatae*, grows in the neighborhood of St. Louis and is common near Allenton and Pacific, Missouri. If *C. speciosa* Sargent (in Trees and Shrubs, I. 65 [1903]) is considered a synonym of Ashe's species, as the examination of a large amount of material recently collected by Palmer seems to justify, the range of this species must be extended to southwestern Missouri, Galena, Cherokee County, Kansas, and to the neighborhood of Farmington, Washington County, Arkansas. Ashe includes southern Illinois in the range of his species but I have seen no specimen from east of the Mississippi River.

Crataegus cupulifera Sargent (in Rochester Acad. Sci. IV. 129 [1903]) was referred to the *Macracanthae* by me in the New York State Bull. 167, 119 (1913) but it really belongs to the *Rotundifoliae* group, and **C. simulans** Sargent (in New York State Bull. CXXII. 125 [1908]) which was later referred by me to *C. cupulifera* as a synonym, belongs as originally described to the *Anomalae*.

Crataegus Wheeleri, an *Intricatae* species from Grand Rapids, Michigan, was published by Sargent in 1907 (in Rep. Geolog. Surv. Michigan, 1906, 552) and is found to be a homonym, a *C. Wheeleri* from Colorado which probably belongs to *C. Douglasii* having been published in 1902 by Nelson (in Bot. Gaz. XXXIV. 369). There is not a specimen of Nelson's plant in the herbarium of the Arboretum. **Crataegus diversifolia**, with broad or narrow ovate leaves of the fruiting branches becoming sometimes distinctly 3-lobed on vigorous sterile shoots, may be adopted as the name of *C. Wheeleri* of Sargent.

Crataegus padifolia var. **incarnata**, n. var.

Leaves ovate, acute and short-pointed at the apex, rounded or abruptly narrowed at the base, acutely and frequently doubly serrate, and often slightly divided into short acute lateral lobes, glabrous with the exception of a few caducous hairs on the upper side of the midrib early in the season, thin, dark green above, slightly paler below, 3–5.5 cm. long and 3–5 cm. wide, with a slender midrib deeply impressed on the upper side, and usually 5 or 6 pairs of slender primary veins; petioles slender, more or less glandular, with glands generally persistent during the season, usually about 1.5

cm. in length; stipules oblanceolate, glandular-serrate, caducous. Flowers 1.5 cm. in diameter, in small mostly 5- or 6-flowered corymbs, furnished with broad conspicuously glandular-serrate deciduous bracts; calyx glabrous with narrow acuminate glandular-serrate lobes often persistent on the ripe fruit; stamens 7–10; anthers pale pink; styles 2–4. Fruit ripening in early October, subglobose, dull crimson, punctate, about 1.5 cm. in diameter; nutlets 3–4, rounded on the back and ends, slightly broader at the apex than at the base, 5–6 mm. in length.

Usually a shrub from 4.5–5 m. high, with stout stems covered with dark corky bark, and erect or ascending branches armed with numerous slender straight or slightly curved dark purple spines 4–5 cm. in length; or often a small tree 5–6 m. high.

Rocky limestone hills near Galena, Stone County, Missouri, *E. J. Palmer*, October 13, 1913 (No. 4645, type for fruit), September 27, 1920 (No. 19,183), April 29, 1924 (No. 24,569, type for flowers), all from plant No. 3; same locality, May 23, 1923 (No. 22,798), April 29, 1924 (No. 24,568). Rocky upland woods, near Cotter, in Marion County, Arkansas, *E. J. Palmer*, June 18, 1914 (No. 6026).

The specimens of Mr. Palmer's plant No. 3 can probably best be regarded as a variety of *C. padifolia* of the *Intricatae* group which occurs in this region, and from which it differs in its generally broader and usually slightly lobed leaves and in its larger and softer crimson fruit.

Crataegus panda has been used for two different plants, first by Beadle in 1902 (Biltmore Bot. Studies, I. 89) for a shrubby species of the *Flavae* group from the neighborhood of Tallahassee, Florida, and second by Ashe in 1903 for a plant from Glendon, N. Carolina (in Jour. Elisha Mitchell Sci. Soc. XIX. 29). The description does not give the group to which this plant belongs and there is not a specimen in the Arboretum herbarium.

Crataegus cirrata was used in 1902 by Beadle (Biltmore Bot. Studies, I. 101) for a shrubby species of the *Flavae* group from Girard, Alabama. The same name was used in 1916 by Ashe (in Bull. Charleston Mus. XII. 42) for a plant from Georgia, no information being given of the type locality or of the group to which it belongs. Ashe's plant is not represented in the Arboretum herbarium.

SYNOPSIS OF NORTH AMERICAN CRATAEGI

ERNEST J. PALMER

INTRODUCTION

The following alphabetical list and synoptical tables of the North American species and varieties of the genus Crataegus was compiled several years ago, in a somewhat different form, for use in the Herbarium of the Arnold Arboretum. It was not intended for publication and was

designed merely for convenient reference and to facilitate the identification of material. The very unusual size of this genus in number of species, the bulk of material in our herbarium and the large accessions constantly accumulating, as well as specimens and collections frequently being received for identification from various parts of the country became so burdensome, even with the ample library and collection of types available here, that it was thought worth while to bring together in as compact a form as possible a synopsis of the information scattered through many publications and indices. It was hoped also that it might at some future time serve as the basis for a fuller study and more complete key to the genus. It is published with some reluctance at this time in the hope that it may prove of wider use and convenience to students of American Crataegus, especially to those who do not have access to much of the original literature or to the collections of the larger herbaria.

It is intended in the index to give a list as complete as possible of the specific and varietal names that have been applied to North American Crataegi. Possibly some names have escaped the writer's attention that should have been included, and many of those listed are given only for reference. No attempt is made to give a complete synonymy under valid names nor of combinations under other generic names. Specific names that have been variously interpreted by different botanists are included but once, exception being made in a few cases where it seems evident that duplication occurred through coincidence and that the authors were referring to different plants. Several instances of this sort will be noted, some of which are corrected in a paper by Professor C. S. Sargent appearing in this issue.

As this paper is not intended as a critical study in the sense of a revision of the genus, I have carefully refrained from making new combinations and so far as possible from going into the question of the validity of names that have been published. However, for the sake of clearness it was found necessary to indicate that certain names are recognized synonyms of others and where these have been used both as of specific and varietal rank to designate the preferred form. In such cases the practice prevailing at present in the Herbarium of the Arnold Arboretum has naturally been followed and names regarded as synonyms are printed in italics. A few obvious orthographical errors in previous publication of names have been corrected and for the sake of uniformity the practice of doubling the final i after consonants except after the ending "er," as recommended in the International Rules of Nomenclature, has been adopted for all names recognized as valid.

The question of synonymy and priority of names in this genus is much complicated by the fact that many North American species were first named from specimens cultivated in European gardens. These names were often without adequate descriptions or figures or with none at all, and in almost all cases without any definite records as to the part of the

country from which the seeds or plants were derived. North America was usually considered sufficiently definite and all of the eastern parts of the continent might be included under the general designations Carolina, Virginia and Canada. These early names were in many cases taken up and variously interpreted by later writers. Some of them, through study of the type specimens where they exist or of the plants still in cultivation have been found to have precedence over later names and more careful study will probably reveal other such cases. It is possible too that duplicate descriptions of some identical plants have been published under different names by later authors working independently.

The species have as far as possible been referred to the natural sections or groups to which they belong, those recognized being the twenty wholly or partially arborescent groups of Sargent's Manual of the Trees of North America and two additional shrubby ones, Uniflorae and Pulcherrimae. Perhaps two or three other small groups should be included in a fuller treatment of the North American species, at least in the writer's opinion. The distinctions between these groups are usually clear but in some cases there is an apparent merging of characters and it is difficult to say to which of two sections certain species belong. Where the group was indicated by the author of the species his treatment has usually been followed when the species comes within the recognized sections, although in a few instances there was some doubt in the writer's mind as to the correctness of the reference. Where the original description does not make the group clear and no specimens were available for examination I have seldom ventured to supply it and such species are necessarily excluded from the synoptical tables. These, with other debatable names that could not definitely be assigned to synonymy and all others of which I have not seen specimens, are indicated by a question mark in parenthesis.

The geographical range is given usually by states and provinces except in the cases of a few widely distributed species where it did not seem necessary to enumerate all political divisions. Where a wider range is indicated than that given in earlier publications it is in all cases based upon specimens examined, most of which are in the Arnold Arboretum Herbarium. In giving type localities, details have sometimes been supplied from the type specimens where these were available.

The synoptical tables were designed merely as a temporary substitute for a more complete key to the genus, the idea being to bring together species having common characters into small groups so that in connection with the geographical range only a few would have to be considered in identifying material. Like ordinary keys they are of course expected to be used only as guides to the fuller descriptions of the manuals.

In these tables the color of the anthers, number of stamens, glabrous or pubescent character of corymbs at flowering time and general shape of